Next 4 Page(s) In Document Exempt

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Copy #3 of 3

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SUBJECT: Internal Combustion Engines in the USSR and Satellites - Ratio of "L" Head to Valve - in - Head Types

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SUMMARY

a. The total inventory of gasoline-burning motor vehicles in the USSR and Satellites is estimated at 1,669,187. The majority of these (estimated 1,437,066 or 86.1%) are equipped with "L" head type engines while the remaining 232,121 (13.9%) have valve-in-head engines. The ratio of "L" head to valve-in-head type engines in gasoline-burning motor vehicles, therefore, approximates 7:1. It is expected that this ratio will increase in favor of the "L" head type since current production of motor vehicles employs the "L" head type almost exclusively.

b. All engines on Soviet and Satellite aircraft equipped with valved engines are of the valve-in-head type.

c. Most stationary engines in the Soviet orbit burn Diesel fuel; the number of gasoline-burning stationary engines is insignificant.

SOVIET AUTOMOTIVE VEHICLES

1. It is estimated that as of 1 July 1950, the USSR motor vehicle inventory consisted of 1,206,000 trucks and passenger cars. Close to 97 percent of these were gasoline driven, about 3 percent were heavy Diesel trucks, and less than 1 percent burned producer gas. About one-third of the inventory was under direct military control of the Soviet armed forces. The inventory does not include vehicles in need of temporary or major repairs, and also excludes tractors and tanks, which ordinarily use valve-in-head Diesel engines. There is no confirmed appreciable use of valve-in-head gasoline engines in the USSR.

2. The valve-in-head engines in the USSR consist of a relatively small number of various imported passenger cars the ZIS 101 (a prewar copy of Buick which has not been manufactured since the war), and one unidentified 6 x 6 vehicle somewhat like the US 2½ ton military truck, but probably not the ZIS 151. This vehicle may have been assembled from imported parts.

3. As a result of the testing of lend-lease vehicles, a Soviet technical commission recommended in 1945 that "engines should be in-line, 6 cylinder and "L" head (for easier maintenance and readier adaptation to producer-gas and compressed gas)". In the U.S., however, both valve-in-head and "L" head engines have rendered good service. In case of manufacture maintenance, replacement, lubrication etc., both engines have been proven satisfactory. Nevertheless, the prewar automotive industry of the USSR was strongly influenced by Ford "L" head designs. During the war, the jeeps and Studebakers shipped to the USSR under lend-lease were of "L" head construction. The entire development of the Soviet automotive industry and the possible need for conversion to substitute fuels probably influenced the technical commission's recommendation.

4. The following gasoline motor vehicles use "L" head valves, according to authoritative Soviet technical sources:

KIM-10	a 4 passenger automobile	of 26 BHP
GAZ-M1	a 4 " "	of 50 BHP
GAZ-M20	a 5 " "	of 50 BHP
ZIS-110	a 7 " "	of 140 BHP
GAZ-AA	1.5 ton truck	of 40 BHP
GAZ-42	1.2 ton gas producer truck	of 30 BHP
GAZ-61	0.5 truck (5 passengers)	76 BHP
GAZ 51	2 to 2.5 ton truck	70 BHP
ZIS 5	2.5 to 3 ton truck	73 BHP
ZIS-21	2.5 ton gas producer truck	47 BHP
ZIS-150	3 to 4 ton truck	90 BHP

5. A fairly competent observer has examined the ZIS 110, the ZIS 150 and the GAZ 51 and found all three to have "L" head valves. The major Soviet production consisting of Pobeda Moscovich, and ZIS passenger cars and GAZ trucks of 1-2 tons and ZIS 2-3 ton trucks probably all use "L" head valves.

6. The estimated serviceable inventory as of 1 July 1950, consists of the following vehicles:

Trucks, 2 tons and under (including some gas-generator vehicles)	542,750
Trucks, 2.5-3 tons	509,900
Diesel trucks	32,850
Total serviceable trucks (including busses, approximately 1.5 percent of total)	1,085,500
Light passenger cars	89,625
Heavy passenger cars	29,875
Total passenger cars	119,500
Total serviceable vehicles	1,205,000

7. Current automotive production in the Soviet Union is estimated as follows:

Estimated Automotive Production in the USSR, 1950	
Light trucks (including 1% to 2% gas-generator trucks)	180,000
Medium trucks	168 000
Diesel trucks	12,000
Light passenger cars	30,000
Heavy passenger cars	10,000
TOTAL	

ESTIMATED

Percentage of U.H.V. Engines in the Motor Bus Inventory of Eastern Europe

Country	Buses	of which Gasoline	U/H U.H.V.
ALBANIA	15	15	15
BULGARIA	1,000	1,000	300
CZECHOSLOVAKIA	4,012	3,162	532
FINLAND	3,000	3,000	1,950
GERMANY	2,355	1,800	1,450
HUNGARY	633	633	160
POLAND	2,400	1,750	630
RUMANIA	1,000	1,000	560
Total	14,415	12,360	5,897

ESTIMATED

Passenger Automobile Inventory

Total Inventory	of which Gasoline	Of which U.H.V.
255,307	217,011	97,729

INTERNAL COMBUSTION ENGINES IN THE SATELLITE STATES

Forty-seven percent of the motor vehicles in the satellite area with four-cycle, gasoline engines are estimated to have overhead valves. Stationary engines are not within the scope of this paper as they are, with rare exceptions, either Diesel engines or two-cycle engines with neither overhead nor side valves. About 15 percent of the passenger automobiles in the total inventory have two-cycle gasoline engines and are disregarded in the above ratio. Fourteen percent of satellite trucks and busses are Diesel powered and are shown in this paper only in the total inventory below.

A marked decrease in the ratio of valve-in head engines to the total satellite inventory of motor vehicle engines can be expected in the next five years. Standardisation of truck types, planned in all Satellites, is being hastened by the retirement of old vehicles of polyglot origin, many of which have OHV engines. These vehicles are being replaced largely by Soviet and Czech trucks, all of which have "L" head engines.

The combined total motor inventory for the Satellite states as of 1 July 1950 was 539,592 trucks, busses and passenger automobiles. Of these 269,870 were trucks, 14,415 were busses, and 255,307 were automobiles. Of these, 40,545 trucks and 2,055 busses were Diesel powered, the remainder operate on gasoline.

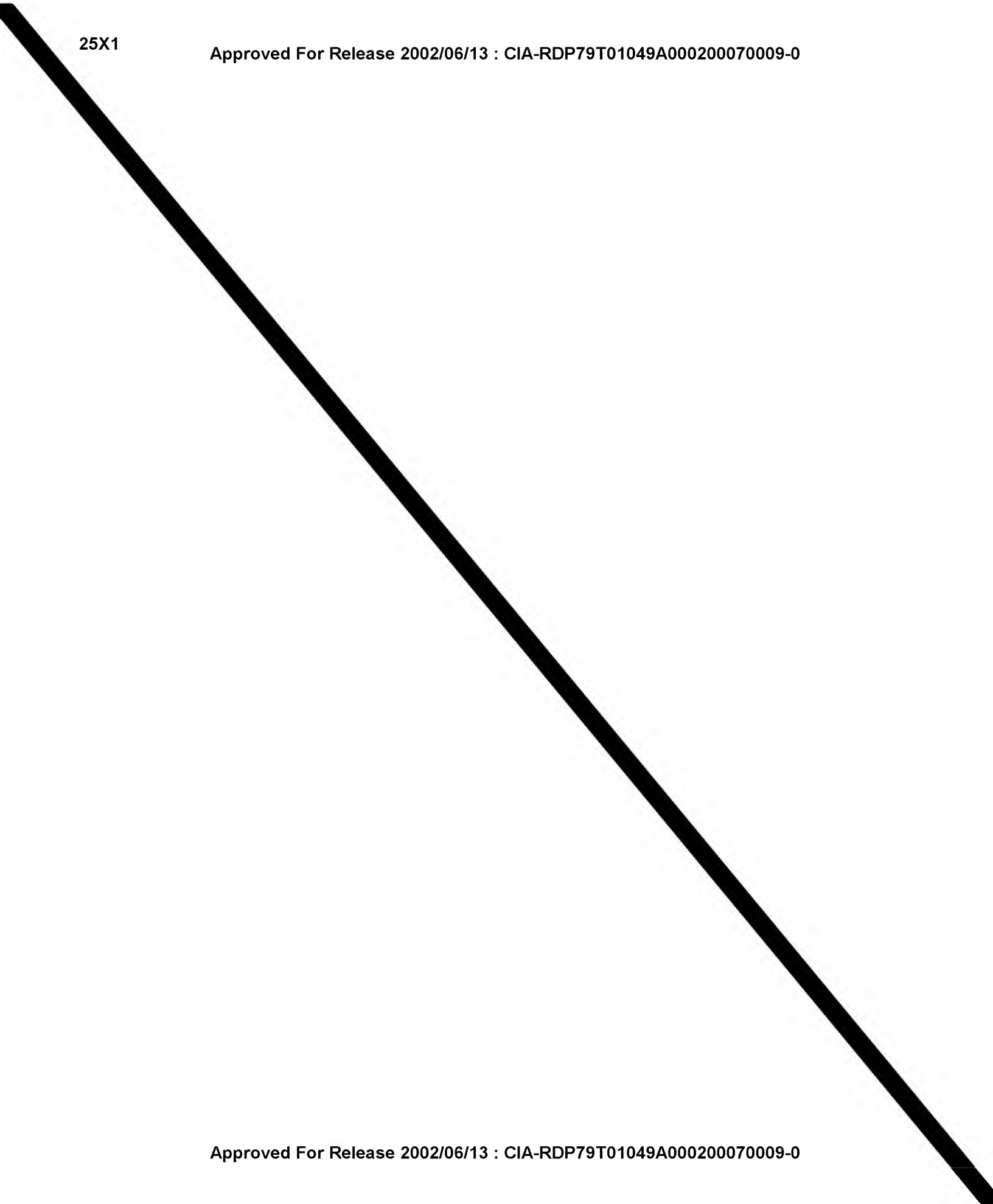
ESTIMATED

Percentage of O.H.V. Engines in
the Motor Vehicle Inventory
of
Eastern Europe

	Total inventory	Of which Gasoline	Of which O.H.V.	% O.H.V. of gasoline
Trucks	269,870	229,370	128,497	51%
Busses	14,415	12,360	5,847	48%
Automobiles	255,307	217,411	97,729	45%
Total	539,592	497,037	232,124	

Percentage of O.H.V. Engines in the
Motor Truck Inventory
of
Eastern Europe
1950

Country	Trucks	of which gasoline	O/H O.H.V.
ALBANIA	1,000	1,000	800
BULGARIA	5,400	5,400	2,700
CZECHOSLOVAKIA	63,970	36,970	7,500
FINLAND	30,500	28,500	18,525
GERMANY, S.Z.	90,000	82,500	66,000
HUNGARY	12,000	11,000	2,750
POLAND	42,000	40,000	13,000
RUMANIA	25,000	24,000	6,720
Total	269,870	229,370	117,995



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